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COLD REGIONS RESEARCH AND ENGINEERING LAB HANOVER N H F/G 13/2  
PUBLIC BUILDINGS FOR THE NORTH (OBSCHESTVENNYE ZDANI A DLIA SE--ETC(U)  
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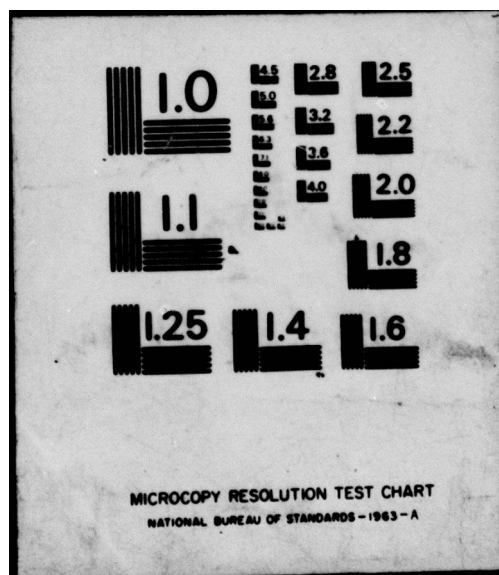
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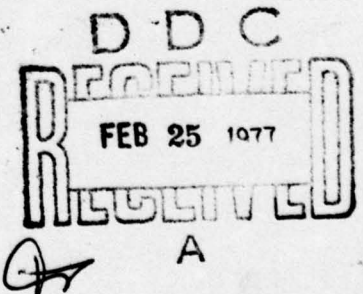


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December 1976

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## PUBLIC BUILDINGS FOR THE NORTH

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CORPS OF ENGINEERS, U.S. ARMY  
COLD REGIONS RESEARCH AND ENGINEERING LABORATORY  
HANOVER, NEW HAMPSHIRE

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PANELS BRICKS FLOORS WALLS	PERMAFROST BENEATH BUILDINGS PILE FOUNDATIONS REINFORCED CONCRETE CONSTRUCTION MATERIALS	PREFABRICATION PUBLIC BUILDINGS
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  This report discusses the design of a public center for a village of 1,000 residents in the Siberian Arctic. It was designed for construction on permafrost soils with a calculated winter air temperature of -45°C. The paper includes layout designs for the building.		

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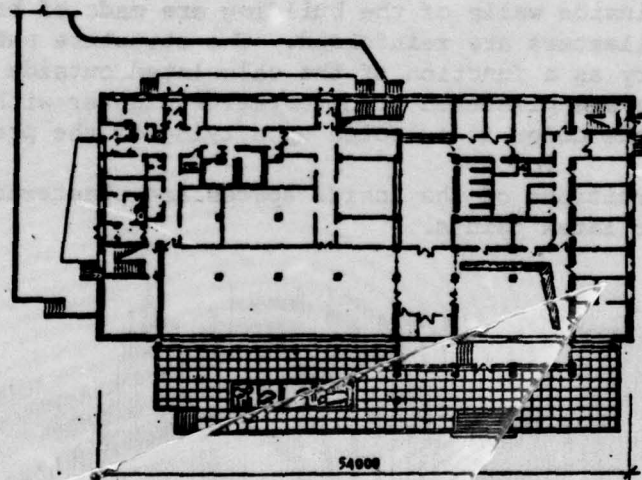
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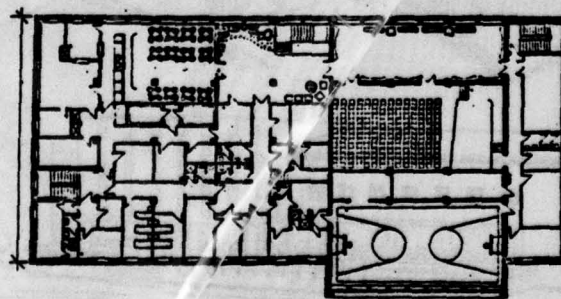
## PUBLIC BUILDINGS FOR THE ARCTIC

### Public Center of a Village for 1,000 Residents

The design of a public center for a village of 1,000 residents for construction in climatic zone No. 1 was developed for construction in the Arctic on permafrost soils with a calculated winter air temperature of  $-45^{\circ}\text{C}$  (there are variants for temperatures of  $-55$  and  $-60^{\circ}\text{C}$ ). The building is related to class II according to capital investment.



First Floor Layout



Second Floor Layout

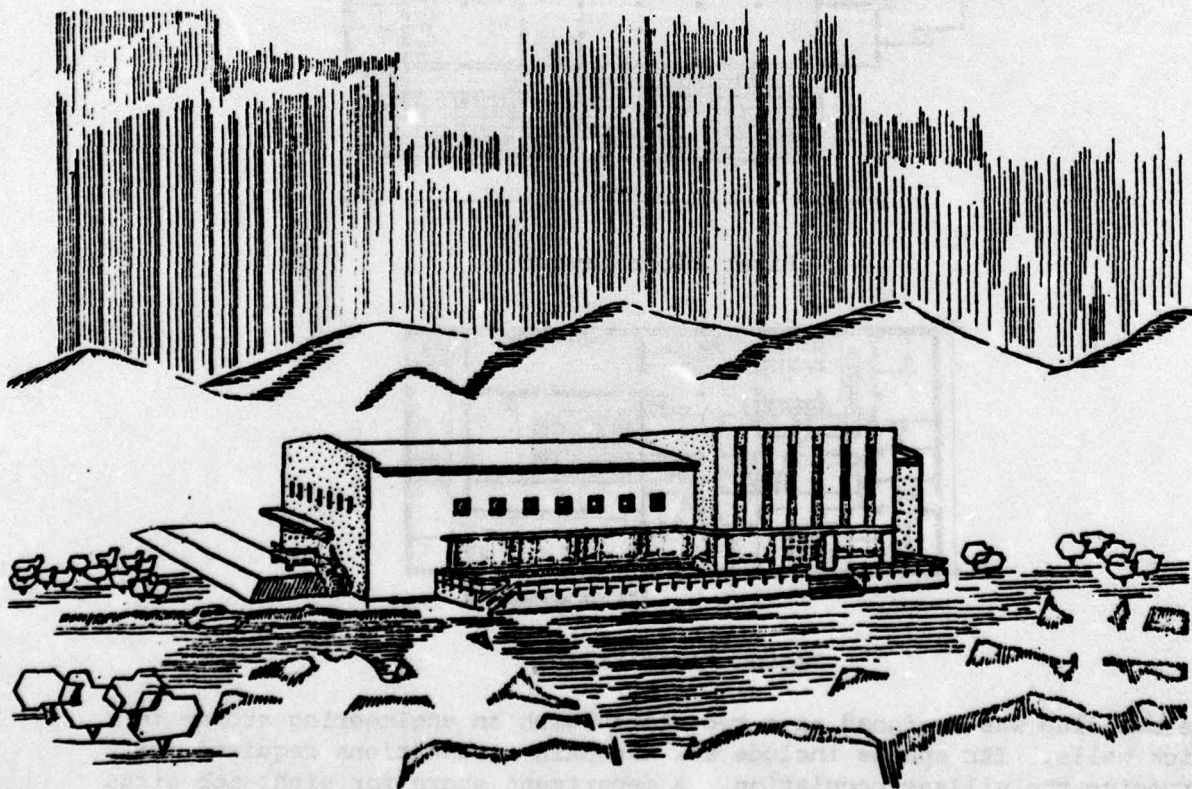
The building was designed as a two-storey with an engineering storey of brick walls. Its spaces include all the main institutions required for servicing the village population. A department store for eight job sites with warehouse spaces is located on the first floor. An everyday service kombinat, post office, telegraph office, an employment office and also

spaces for public organizations are also found here. A 48-seat restaurant with auxiliary spaces and a 182-seat movie theater with a group of club spaces is located on the second floor. A gymnasium (18.0 x 9.0 m) with balcony, to which are adjacent dressing rooms with showers, is located on this same floor. A barber shop and hotel for new arrivals (two numbers) are also included in the complex of spaces on the second floor. Ventilation chambers are located in the engineering storey.

The compactness of the layout of the center building was predetermined by the natural climatic conditions of the Arctic. The entire space is raised above the ground to retain the permafrost condition of the soil.

The outside and inside walls of the building are made of brick; the columns, partitions and pilasters are reinforced. The structure and thickness of the outside walls vary as a function of the calculated outside air temperature. The outside walls are plastered with terrazite plaster with light-toned color added and the color is selected upon tying of the project.

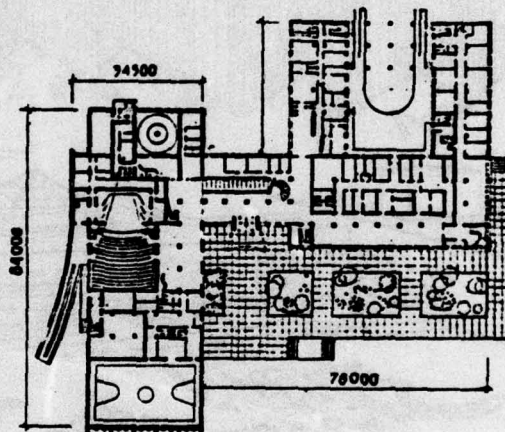
The walls and partitions of the inside spaces are plastered and painted with oil-based or latex paints.



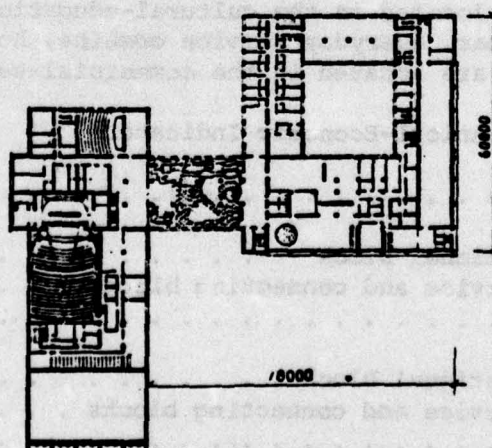
The center building is equipped with various types of engineering devices (central heating, water supply, ventilation, sewer drain, electricity, radio facilities and so on).

# PUBLIC CENTER FOR A VILLAGE OF 6,000 RESIDENTS

The building complex of the public center is designed to provide the village population with the main types of cultural and everyday service and contains a manufactured goods store for 30 job sites, a food store for 18 job sites, a dining hall with food prepared on the premises (a restaurant in the evening) for 100 seats with regard to providing semi-prepared meals in the dining hall attached to the school; a snack bar for 80 seats; an everyday services combine with barber shop and hairdresser for 38 job sites; a communications section of category IV and a savings bank; a 24-bed hotel; a club with movie theater for 600 seats, a library of 30,000 books, study rooms (150 sq. m); a gymnasium 18 x 30 m in dimensions; and spaces for the village soviet and public organizations (120 m<sup>2</sup>).



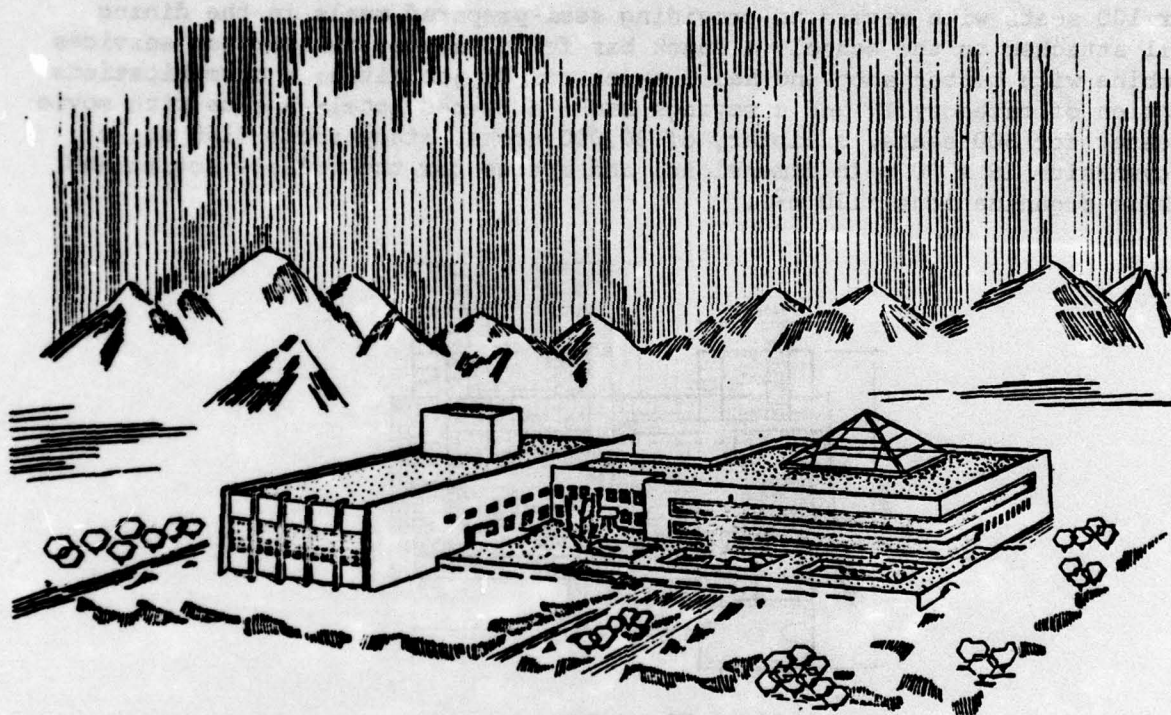
First Floor Layout



Second Floor Layout

The complex consists of two main building blocks -- cultural-educational and trade-service buildings resolved in the form of two-storey spaces.

The buildings are connected to each other by a connecting block where the entry vestibule and spaces for the work of the village soviet and public organizations are located on the first floor and a foyer and winter garden are located on the second floor.



A club and gymnasium are located in the cultural-educational block. Stores, a dining hall and snack bar, everyday service combine, hotel, communications section and savings bank are located in the commercial-service block.

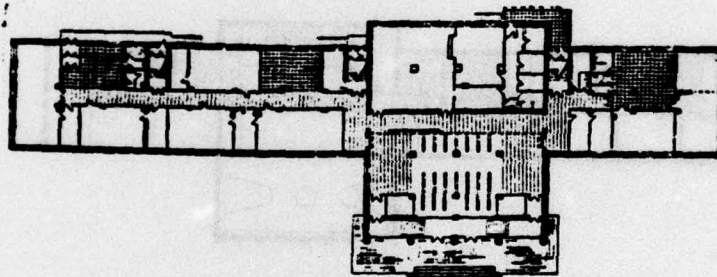
#### Technical-Economic Indicators:

Construction volume . . . . .	46,170 m <sup>3</sup>
including:	
culture-educational block . . . . .	23,250 m <sup>3</sup>
commercial-service and connecting blocks . . .	22,920 m <sup>3</sup>
Working area . . . . .	8,064 m <sup>2</sup>
including:	
cultural-educational block . . . . .	3,503 m <sup>2</sup>
commercial-service and connecting blocks . . .	4,561 m <sup>2</sup>
Utility area . . . . .	9,311 m <sup>2</sup>
including:	
culture-educational block . . . . .	4,134 m <sup>2</sup>
commercial-service and connecting blocks . . .	5,177 m <sup>2</sup>

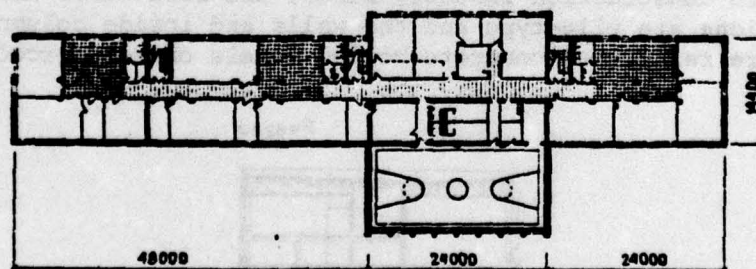
**SCHOOL FOR 784 STUDENTS**  
(Standard Project No. 224-1-93M)

The design principles of buildings for the Arctic are reflected in the standard design of a 10-year general educational school for 20 grades (784 students): protruding sections, outside stairs and the outside wall perimeter are reduced to a minimum; a ventilated subfloor is provided in the building foundation to retain the permafrost conditions of the soil.

The school building is resolved by a single compact space with a protruding central section. The layout is subject to the idea of the mixed method of teaching: the spaces for students of grades 1-4 are permanent while students of grades 5-10 study in a classroom system. Taking this into account, the school building is designed as a three-storey building with grouped spaces into three academic sections.

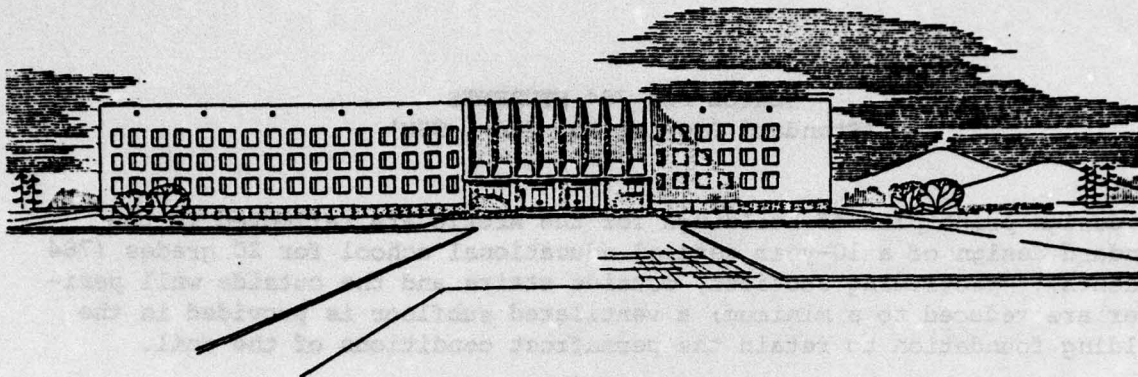


First Floor Layout



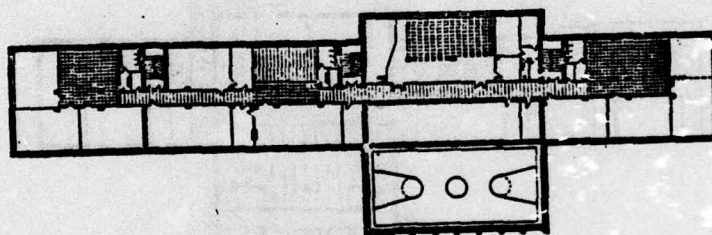
Second Floor Layout

The building layout provides clear zoning of spaces according to technological and hygiene requirements: the right wing is allocated to the primary school. The central space is occupied by the general school space. The academic offices, laboratories and workshops are located in the left wing.



Facade

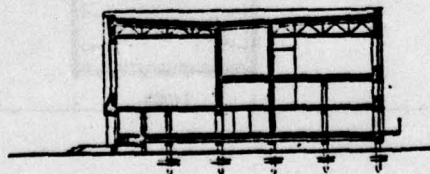
The presence of a solarium, increased recreational areas and live nature corners, day-care spaces and so on also correspond to Arctic conditions.



Third Floor Layout

To provide the possibility of erecting the building in regions where there are no modern construction industry bases, the structures are simple types: the foundations are pile-type and the walls and inside columns are brick. The roofs are reinforced concrete hollow panels on reinforced concrete strigners.

Passage

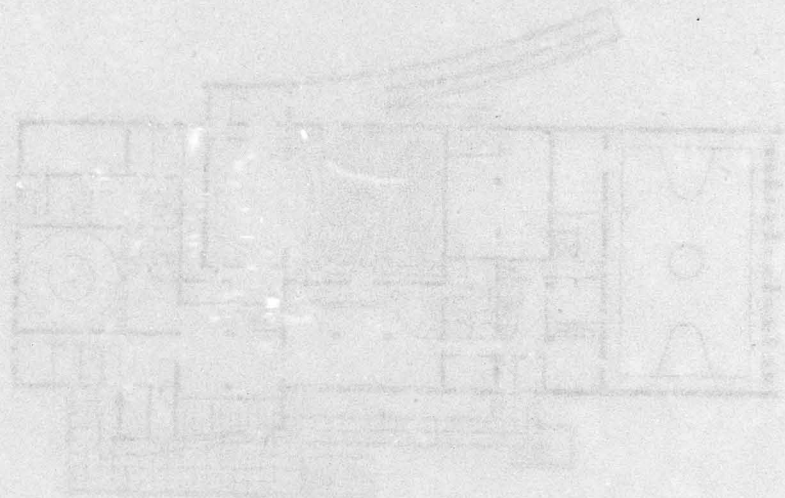


Cross-Section

The engineering equipment provides for creation of comfortable conditions: forced-exhaust ventilation provides heating and humidifying of the air supplied to the school spaces, the first-storey floors in the classrooms and offices are heated by hot air circulated under the floor and there is a heat curtain near the entrance.

Construction volume . . . 21,000 m<sup>3</sup>  
 Area of construction site 1,870 m<sup>2</sup>  
 Work area . . . . . 3,938 m<sup>2</sup>  
 Utility area . . . . . 4,389 m<sup>2</sup>

The design of a ship building with 100-ton capacity, designed to service the population of various towns and villages with various types of mass transport and other local work, is of considerable interest. The building should be located in the center of populated points and in this regard will be of great importance.



First floor plan

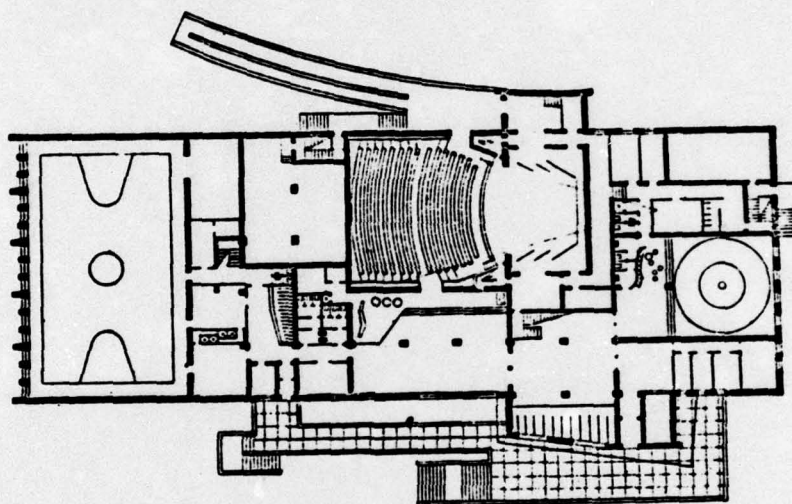


Second floor plan

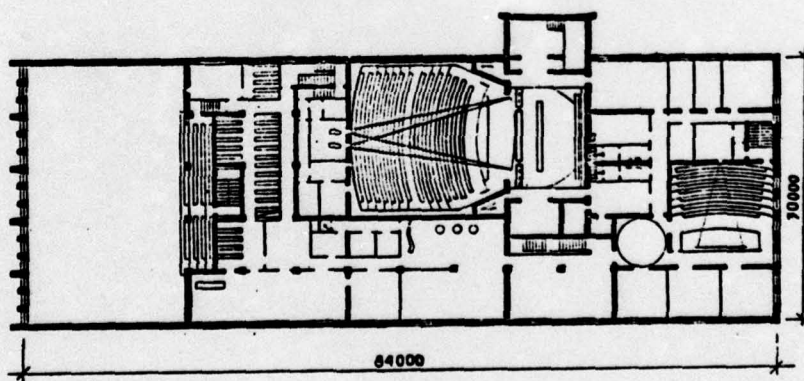
All the rooms are divided into sub-rooms, 100-ton capacity. The building is designed to service the population of various towns and villages with various types of mass transport and other local work, is of considerable interest. The building should be located in the center of populated points and in this regard will be of great importance.

### STANDARD 400-SEAT CLUB

The design of a club building with 400-seat theater, designed to service the population of Arctic towns and villages with various types of mass cultural and educational work, is of considerable interest. The building should be located in public centers of populated points and in this regard will be of great urban-planning significance.



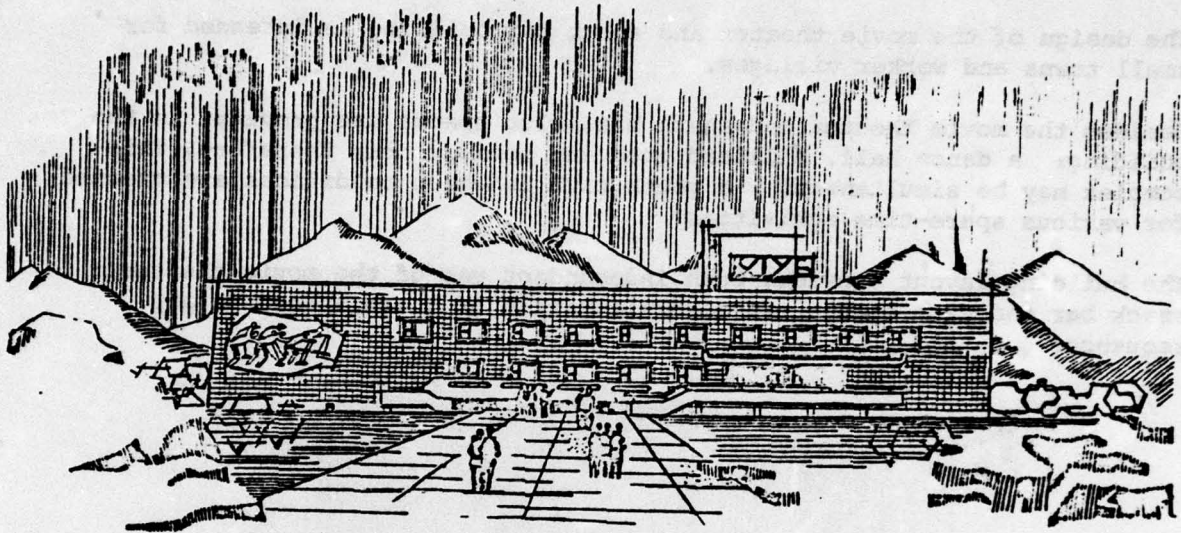
First Floor Layout



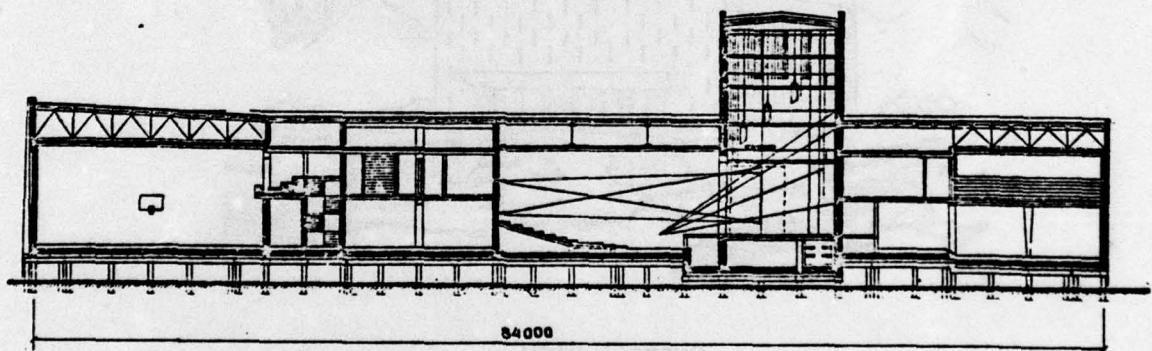
Second Floor Layout

All the club spaces are divided into entertainment, club, sports and administrative-management groups and in this case the building configuration meets the severe natural conditions of the construction region: the building is resolved as a single space, the number of entrances is minimal, the outside wall perimeter is reduced to the maximum and there is a ventilated subfloor.

At the same time the layout solution permits complete use of all groups of the club spaces without mutual interference and intersections of human traffic.



Facade



Cross-Section

The entertainment complex permits presentation of any types of shows and is equipped according to theater buildings.

The building structures are simple: the foundations are pile-type, the walls are brick, the floors are hollow panels on reinforced concrete stringers and the roofs are steel sections.

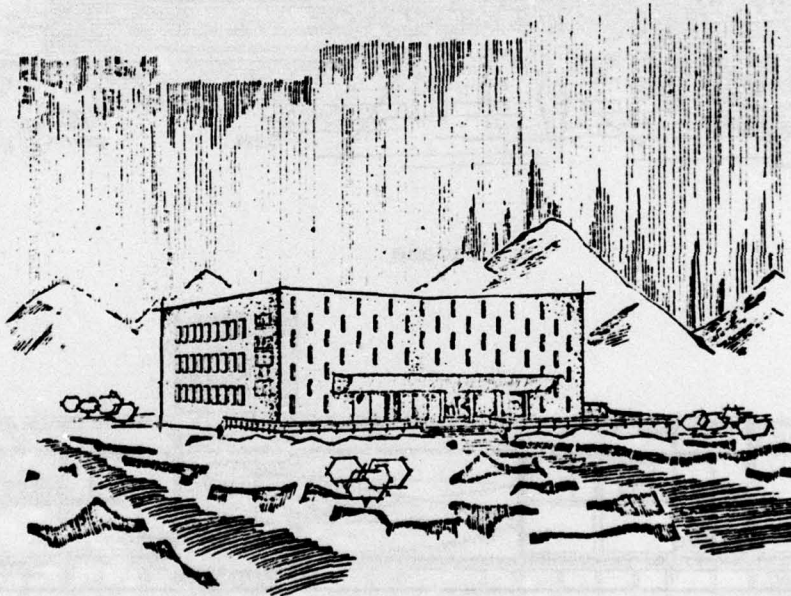
The engineering equipment, besides ordinary functions, provides forced-air heating and humidifying; there is a thermal curtain near the entrance.

## A WIDE-SCREEN 400-SEAT MOVIE THEATER WITH A 100-SEAT SNACK BAR

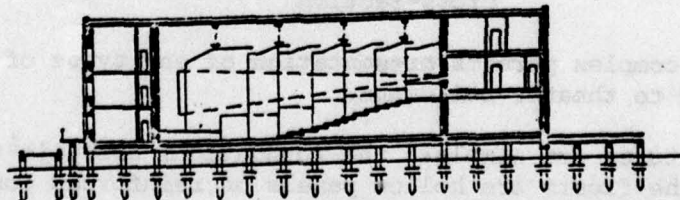
The design of the movie theater and snack bar building is intended for small towns and worker villages.

Besides the movie theater and snack bar, club spaces are provided in the building: a dance hall, billiard room and social room; therefore, this complex may be simultaneously a youth club in which conditions are created for various spare-time activities.

The building layout provides both independent use of the movie theater, snack bar and club spaces and also visitation of these spaces in any sequence.



Overall View

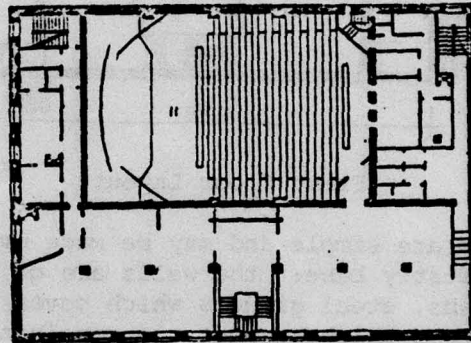


Cross-Section

The one-storey movie theater and the three-storey sections where the vestibule, snack bar, foyer and club rooms are located, are a single space of simple shape with overall dimensions of 30 x 42 m (on the axes).

Visitors on the first floor, passing through the box office, enter the entrance vestibule with a common cloakroom and then, climbing the stairs to the second floor, either enter the foyer of the movie theater or the snack bar. Having climbed to the third floor, one can either pass into the billiard and social room or into the dance hall. Spectators coming from the movie theater enter directly into the exit vestibule without encountering other visitors.

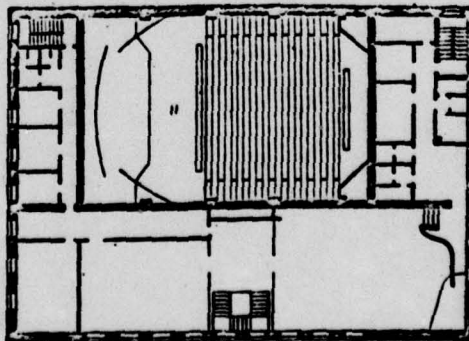
The movie theater is equipped with a wide-screen movie installation. It has an acoustical ceiling and walls. The seats are arranged like an amphitheater, which improves visibility.



Second Floor Layout

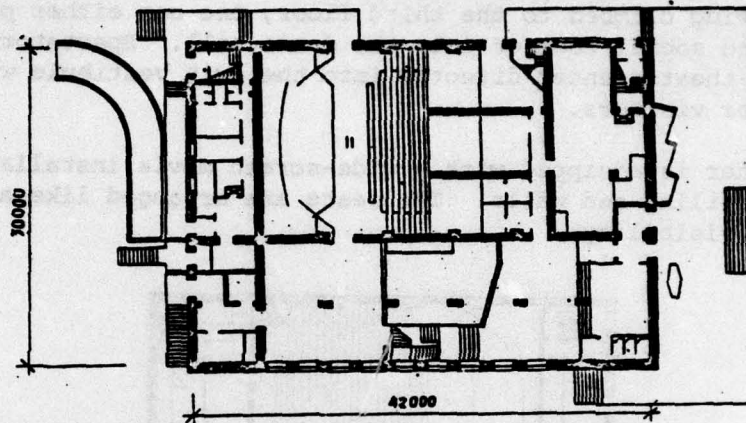
The movie theater foyer, the dance hall and snack bar are provided with radios and the sound insulation used in the design prevents sound from penetrating into the movie theater.

The building is equipped with forced ventilation with heating and humidifying of the air fed to the spaces, thermal curtains near the entrance and exit, water pipelines, sewer drains and other modern types of engineering equipment.



Third Floor Layout

Modern finishing materials and fluorescent lighting are used in finishing the rooms.

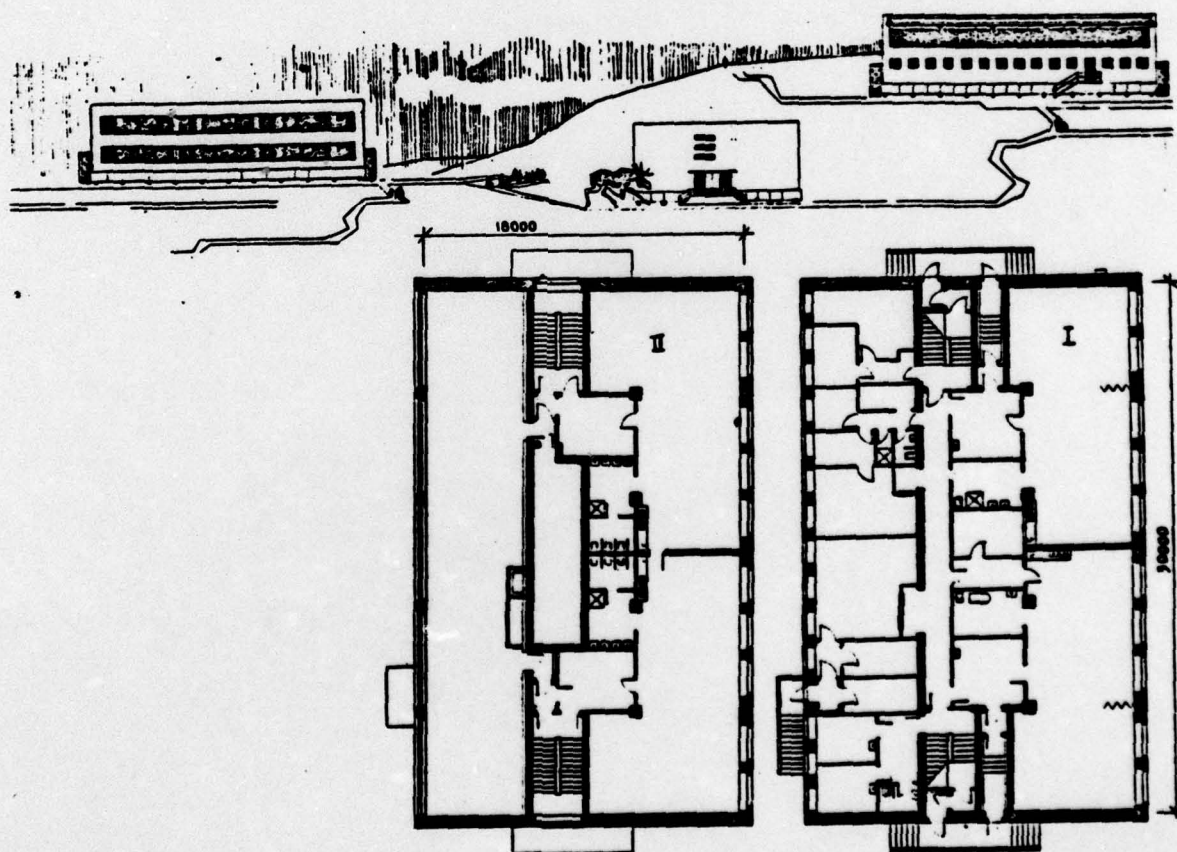


First Floor Layout

The building structures are simple and may be made even without a developed modern construction industry base: the walls are of brick, the floors are of precast concrete slabs, steel girders which cover the movie theater, and precast concrete beams which support the remaining floors and roofs. The foundation structures -- precast piles and monolithic reinforced concrete foundation mats -- provide retention of the permafrost conditions of the soil. The use of the design is possible in locations with ordinary soil conditions.

# 90-SEAT CHILDREN'S BOARDING SCHOOL-KINDERGARTEN

The building is designed for four groups of boarding-school children: two groups of day-nursery age, 20 seats each, and two groups of children ranging in age from 3 to 7 years, 25 seats each. The building is two-storey with the simplest configuration. The day-nursery groups and administrative-service spaces are located on the first floor and the kindergarten groups and an unheated play area are located on the second floor. The design layout of the building is solved with supported outside and inside walls and columns and reinforced concrete stringers with support of reinforced concrete floor slabs on the walls and stringers. A ventilated subfloor with protection against snowdrifts is provided under the entire building. The foundations are pile-type (a variant is column-type).



The building is equipped with all types of engineering services and amenities: central heating, forced ventilation, running water, sewer drains, electricity, telephones and radios.

Technical-Economic Indicators:

Area of construction site . . .	583.01 m <sup>2</sup>
Utility area . . . . .	873.2 m <sup>2</sup>
Work area . . . . .	801.4 m <sup>2</sup>
Construction volume . . . . .	3,777.8 m <sup>3</sup>
including	
Veranda volume . . . . .	488.5 m <sup>3</sup>